SECTION TABLE OF CONTENTS

DIVISION 05 - METALS

SECTION 05502

MISCELLANEOUS METAL

-- End of Section Table of Contents --

SECTION 05502

MISCELLANEOUS METAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(2000) Carbon Structural Steel
ASTM A 53/A 53M	(1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 123	(2000) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 320/A 320M	(2000) Alloy Steel Bolting Materials for Low-Temperature Service
ASTM A 467	(1998) Machine and Coil Chain
ASTM A 500	(1999) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 653	(2000) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 702	(1989; R 1994e1) Steel Fence Posts and Assemblies, Hot Wrought
ASTM A 780	(2000) Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings
ASTM A 924/A 924M	(1999) General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B 32	(1996) Solder Metal
ASTM F 626	(1996a) Fence Fittings
ASTM F 1083	(1997) Specification for Pipe, Steel,

	Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	(2000) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B18.2.1	(1996) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(1987; R 1993) Square and Hex Nuts (Inch Series)

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1923	(Rev A) Shield, Expansion (Lag, Machine and Externally Threaded Wedge Bolt Anchors)

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Miscellaneous Metal Items; G, RE.

Detail drawings indicating material thickness, type, grade, and class; dimensions; and construction details. Drawings shall include catalog cuts, erection details, manufacturer's descriptive data and installation instructions, and templates. Detail drawings for the following items: Pipe safely railing, metal fences and gates.

1.3 GENERAL REQUIREMENTS

The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with AWS D1.1. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123, ASTM A 653, or ASTM A 924/A 924M, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

1.4 DISSIMILAR MATERIALS

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint or asphalt varnish.

1.5 WORKMANSHIP

Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

1.6 ANCHORAGE

Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts made to engage with the anchors, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; and lag bolts and screws for wood.

1.7 SHOP PAINTING

Surfaces of ferrous metal except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating unless otherwise specified. Surfaces of items to be embedded in concrete shall not be painted. Items to be finish painted shall be prepared according to manufacturer's recommendations or as specified.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 General

Materials indicated on the drawings or required in the work and not covered elsewhere by detailed requirements shall conform to the requirements of this section. In all cases not specifically covered in these specifications, the Contractor shall furnish approved highest grade commercial materials or products which are suitable for intended use of the item.

2.1.2 Structural Shapes and Plates

Steel bars, shapes and plates shall conform to ASTM A 36/A 36M. Galvanized coatings where required, shall conform to ASTM A 123.

2.1.3 Steel Pipes

Steel pipe shall be zinc-coated steel pipe conforming to the requirements of ASTM A 53/A 53M, Standard Weight, Schedule 40.

2.1.4 Corrosion-Resisting Steel Bolts and Anchor Bolts

Corrosion-resisting steel bolts and anchor bolts shall conform to the applicable requirements of ASTM A 320/A 320M, Grade B8.

2.1.5 Bolts

Bolts shall confirm to ASME B18.2.1. Bolts and anchor bolts shall conform to the applicable requirements of ASTM A 320/A 320M, Grade B8.

2.1.6 Nuts

Nuts shall confirm to ASME B18.2.2. Nuts shall be galvanized.

2.1.7 Expansion Anchors

Expansion anchors shall conform to the applicable requirements of CID A-A-1923. Anchors shall be multiple unit with inside thread.

2.1.8 Concrete, Mortar and Grout

Concrete, motar and grout shall conform to the requirements of Section 03301 CAST-IN-PLACE STRUCTURAL CONCRETE.

2.1.9 Steel Safety Railing, Including Carbon Steel Inserts

Steel safety railing, including inserts in concrete, shall be steel pipe conforming to ASTM A 53/A 53M or structural tubing conforming to ASTM A 500, Grade A or B of equivalent strength. Steel railings shall be 38 mm nominal size. Railings shall be hot-dip galvanized. Pipe collars shall be hot-dip galvanized steel.

a. Joint posts, rail, and corners shall be fabricated by one of the following methods:

(1) Flush type rail fittings of commercial standard, welded and ground smooth with railing splice locks secured with 10 mm hexagonal recessed-head setscrews.

(2) Mitered and welded joints by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Railing splices shall be butted and reinforced by a tight fitting interior sleeve not less than 150 mm long.

(3) Railings may be bent at corners in lieu of jointing, provided bends are made in suitable jigs and the pipe is not crushed.

2.1.10 Chain Safety Gate

Safety chains shall be galvanized welded steel, proof coil chain tested in accordance with ASTM A 467, Class CS. Safety chains shall be straight link style, 5 mm diameter, minimum 39 links per meter (12 links per foot) and with bolt type snap hooks on one end. Eye bolts for attachment of chains shall be galvanized 10 mm bolt with 19 mm eye, anchored as indicated. The safety chain shall accommodate a eye bolt snap as indicated on the drawings.

2.1.11 Wall ladder Rungs

Wall ladder rungs shall be galvanized steel. Steel bars, shapes and plates shall conform to ASTM A 36/A 36M. Galvanized coatings shall conform to ASTM A 123.

2.1.12 Metal Fences and Gate Materials

Metal fence and gate materials (fence posts, gate posts, pickets, and cross pieces shall be galvanized square tubes to the sizes shown on the drawings and in accordance with applicable portions of ASTM A 500 and/or ASTM F 1083 and ASTM A 702. Metal fences and gates shall be galvanized after fabrication in the shop. Care shall be taken to deform picket tubes to the details shown on the drawings without "breaking" the steel. Any tube deformations that demonstrate visible cracking or weaking shall be cause for rejection. The metal gate components shall be galvanized. Galvanizing coatings shall conform to ASTM A 123. Any damage to galvanized surfaces, including welding, cutting or deformed area of galvanizing metal shall be repaired with paint containing zinc dust in accordance with ASTM A 780 or shall be neatly coated with Grade 50B solder conforming to ASTM B 32. Accessories shall be standard commercial or in accordance with ASTM F 626.

2.2 MISCELLANEOUS

Miscellaneous plates and shapes for items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous mountings, and frames, shall be provided to complete the work.

2.3 TRENCH COVERS, FRAMES, AND LINERS

Trench covers shall be designed to meet the indicated load requirements. Trench frames and anchors shall be all welded steel construction designed to match cover. Covers shall have flush drop handles formed of 6 mm round stock, and shall be raised-tread, or steel floor plate. Trench liners shall be cast iron with integral frame for cover.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

All items shall be installed at the locations shown and according to the manufacturer's recommendations. Items listed below require additional

procedures as specified. Contractor shall submit detailed drawings of miscellaneous metal items. Detail drawings shall indicate material thickness, type, grade, and class; dimensions; and construction details. Drawings shall include catalog cuts, erection details, manufacturer's descriptive data and installation instructions, and templates. Detail drawings shall include pipe safely railings.

3.2 INSTALLATION OF PIPE GUARDS

Pipe guards shall be set vertically in concrete piers. Piers shall be constructed of, and the hollow cores of the pipe filled with, concrete specified in SECTION 03301 CAST-IN-PLACE STRUCTURAL CONCRETE.

3.3 PIPE SAFETY RAILING AND GATES

Pipe Safety Railing and gates shall be galvanized after fabrication in the shop. Care shall be taken to deform pipe without "breaking" the steel. Any pipe deformations that demonstrate visible cracking or weaking may be cause for rejection. The pipe gate components shall be galvanized. Welded, cut, damaged, and deformed area of galvanizing metal shall be neatly coated with Grade 50B solder conforming to ASTM B 32. The Contractor shall grease pipe thoroughly with grease immediately after installation of chains at each gate opening. The Contractor shall examine and certify the operation of all safety pipe railing not sooner then 30 days after installation.

3.3.1 Attachment of Handrails

Splices, where required, shall be made at expansion joints. Removable sections shall be installed as indicated.

3.3.1.1 Installation of Steel Handrails

Installation shall be in pipe sleeves embedded in concrete and filled with molten lead or sulphur with anchorage covered with standard pipe collar pinned to post. Rail ends shall be secured by steel pipe flanges.

3.3.1.2 Mounting of Safety Chains

Safety chains shall be mounted 900 mm and 610 mm above the floor.

3.4 METAL FENCES AND GATES

3.4.1 GENERAL INSTALLATION FOR METAL FENCES AND GATES

Metal fences and gates shall be installed to the lines and grades indicated. The area on either side of the metal fence line shall be cleared to the extent indicated. Line posts shall be spaced equidistant at intervals not exceeding 2.5 meters (8.2 feet). Terminal (corner, and gate) posts shall be set at abrupt changes in vertical and horizontal alignment. Metal cross members and vertical pickets shall be continuous installation between posts. Any damage to galvanized surfaces, including welding, cutting or deformed area of galvanizing metal shall be repaired with paint containing zinc dust in accordance with ASTM A 780 or shall be neatly

coated with Grade 50B solder conforming to ASTM B 32.

3.4.2 EXCAVATION FOR METAL FENCES AND GATES

Metal fence and gate post holes shall be cleared of loose material. Waste material shall be spread where directed. The ground surface irregularities along the metal fence line shall be eliminated to the extent necessary to maintain a 150 mm clearance between the bottom of the metal pickets and finish grade.

3.4.3 INSTALLATION FOR METAL FENCE POST

3.4.3.1 Posts for Metal Fences and Gates

Posts shall be set plumb and in alignment. Except where solid rock is encountered, posts shall be set in concrete to the depth indicated on the drawings. Where solid rock is encountered with no overburden, posts shall be set to a minimum depth of 900 mm (36 inches) in rock. Where solid rock is covered with an overburden of soil or loose rock, posts shall be set to the minimum depth indicated on the drawing unless a penetration of 900 mm (36 inches) in solid rock is achieved before reaching the indicated depth, in which case depth of penetration shall terminate. All portions of posts set in rock shall be grouted. Portions of posts not set in rock shall be set in concrete from the rock to ground level. Posts set in concrete shall be set in holes not less than the diameter shown on the drawings. Diameters of holes in solid rock shall be at least 25 mm (1 inch) greater than the largest cross section of the post, for the square tube it is the largest diagonal distance. Concrete and grout shall be thoroughly consolidated around each post, shall be free of voids and finished to form a dome. Concrete and grout shall be allowed to cure for 72 hours prior to attachment of any item to the posts.

3.4.4 CROSS MEMBERS

3.4.4.1 Top Cross Member

Top rail shall be supported at each post by welding as shown in the drawings.

3.4.4.2 Bottom Cross Member

The bottom cross member shall be supported at each post by welding as shown in the drawings.

3.4.5 VERTICAL METAL PICKETS

Vertical metal pickets shall be installed as shown on the drawings. The bottom of the vertical metal pickets shall be 150 mm (6 inches) above the ground.

3.4.6 METAL GATE INSTALLATION

Metal gates shall be installed at the locations shown. Hinged gates shall be mounted to swing as indicated. Latches, stops, and keepers shall be

installed as required. Padlocks shall be attached to gates or gate posts with chains. Hinge pins, and hardware shall be welded or otherwise secured to prevent removal.

3.4.7 GROUNDING FOR METAL FENCES AND GATES

Except as indicated below, metal fences that are electrically continuous with metal posts extending at least 600 mm into the ground require no additional grounding. Other fences shall be grounded on each side of every gate. Fences shall be grounded by means of ground rods every 300 to 450 m of length when fences are located in isolated places, and every 150 to 225 m when in proximity (30 m or less) to public roads, highways, and buildings. The connection to ground shall be made from the post where it is of metal and is electricallsy continuous with the fencing.

Metal fences crossed by overhead powerlines in excess of 600 volts shall be grounded. Metal fence systems crossed by powerlines of 600 volts or more shall be grounded at or near the point of crossing and at distances not exceeding 45 m on each side of crossing. Ground conductor shall consist of No. 8 AWG solid copper wire. Grounding electrodes shall be 19 mm (3/4 inch) by 3.05 m (10 foot) long copper-clad steel rod. Electrodes shall be driven into the earth so that the top of the electrode is at least 152 mm (6 inches) below the grade. Where driving is impracticable, electrodes shall be buried a minimum of 305 mm deep and radially from the fence. The top of the electrode shall be not less than 0.6 m or more than 2.4 m from the fence. Ground conductor shall be clamped to the fence or railing and electrodes with bronze grounding clamps to create electrical continuity between fence posts, fence fabric, and ground rods.

3.4.8 OPERATION FOR METAL FENCES AND GATES

The Contractor shall examine and certify the operation of all metal fences and gates not sooner then 30 days after installation.

-- End of Section --